REMARKS

Claims 1, 3-10, 12, 13, 18, 21, 22, 25 and 26 are all the claims pending in the application.

The Examiner acknowledges that applicants have submitted a return postcard receipt indicating that there was a proper filing of the English-language specification of the provisional application.

The Examiner states, however, that the English-language translation appears to have been misplaced and/or incorrectly matched with the provisional application. The Examiner, therefore, requests applicants to resubmit the verified English-language translation, clearly stating that it is a replacement copy to replace the misplaced original. The Examiner also asks applicants to include a copy of the return postcard when filing the replacement copy in the provisional application.

In response, applicants are filing concurrently herewith another copy of the verified English translation in the provisional application.

Claims 1, 3-10, 12, 13, 18, 21, 22, 25 and 26 have been rejected on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-18 of U.S. Patent 7,132,176 to Iwasaki et al for reasons of record.

Applicants submit that the present claims as amended above are not obvious from the claims of Iwasaki et al and, accordingly, request withdrawal of this rejection.

Claim 1 of the present application as amended above is directed to a magnetic recording medium comprising a magnetic substrate and at least three layers formed on the magnetic substrate and comprised of an orientation-controlling layer for controlling orientation of a layer

formed directly thereon, a perpendicular magnetic layer, and a protective layer. The perpendicular magnetic layer comprises two or more magnetic layers. At least one of the magnetic layers is a lower layer having Co as a main component and containing Pt and an oxide. At least one of the magnetic layers is an upper layer having Co as a main component and containing Cr and no oxide. The lower magnetic layer comprises magnetic crystal grains isolate by the oxide and dispersed in the lower layer, and the crystal grains vertically penetrate the lower layer in columnar forms. The upper layer comprises magnetic crystal grains that are formed and epitaxially grown on the magnetic crystal grains of the lower layer on an upper surface of the lower.

Thus, the "magnetic layer" set forth in the claims of the present application comprises a lower layer having a structure in which magnetic grains are dispersed in a matrix comprised of an oxide, as disclosed at page 14, lines 21-23, page 215, lines 4-7 and Figure 2, and an upper layer containing no oxide.

Among those skilled in the art, a structure in which magnetic grains are dispersed in a matrix such as an oxide, is called a granular structure. See the attached article by S.H. Liou et al., "Granular metal films as recording media," *Appl. Phys. Lett. 52(6)*:512-514 (February 8 1988). In the following comments, applicants employ the term "granular structure" for a structure in which magnetic grains are dispersed in an oxide and, for the sake of convenience, employ the term "a non-granular structure" for a structure that is not the granular structure.

Applicants have amended claims 1 and 18 as shown above to make it clear that the "magnetic layer" of the present invention comprises a lower layer having a granular structure in

which the magnetic grains are isolated by the oxide and an upper layer having a non-granular structure.

The amendments to the claims are supported by the description at page 14, lines 10-15 and 21-23, page 15, lines 4-7, of the present specification, and FIG. 2 of the present application.

Claim 18 is directed to a method for producing a magnetic recording medium and has been amended in a manner similar to claim 1.

None of the claims of the '176 patent recite a lower magnetic layer comprising magnetic crystal grains isolated by the oxide and dispersed in the lower layer and wherein the crystal grains vertically penetrate the lower layer in columnar forms. In addition, none of the claims of the '176 recite an upper layer that comprises magnetic crystal grains that are formed and epitaxially grown on the magnetic crystal grains of the lower layer on an upper surface of the lower.

The Examiner acknowledges that applicants have argued that none of the claims of the Iwasaki et al '176 patent recite the structure of the lower magnetic layer, and that the claims do not state that the upper layer is epitaxially grown on the lower layer.

The Examiner responds by stating that since the claims in the Iwasaki et al '176 patent specifically address the magnetic layers of the recording medium, the Examiner is entitled to rely on those portions of the specification of the Iwasaki et al '176 patent that discuss the crystal structure to be used for the magnetic layer.

Applicants point out, however, that the Examiner does not identify those portions of the specification of the Iwasaki et al '176 patent upon which he relies. Accordingly, it is not entirely

clear how the Examiner arrives at the structure of the present claims from the teachings of Iwasaki et al.

Applicants point out that the Iwasaki et al '176 patent nowhere discloses columnar grains.

Applicants request the Examiner to clarify and identify those portions of the Iwasaki et al '176 specification upon which he relies.

The Examiner states that with respect to the term "epitaxially grown," he gives this term a broader interpretation than it appears that applicants are arguing. Specifically, the Examiner states that he is interpreting the term "epitaxially grown" to merely require that both layers are crystalline. The Examiner states that the layers need not be directly adjacent or directly correlated in any manner.

Applicants do not understand how the Examiner arrives at this interpretation of the term "epitaxially grown." The Examiner provides no reasoning in support of this interpretation.

The term "epitaxial growth" means that a crystal is grown on the surface of another crystal, while retaining a specific crystal orientation relationship. In the present invention, the magnetic grains in the upper layer are "epitaxially grown" on the upper surface of columnar magnetic grains having their peripheries isolated from one another by an oxide, while retaining a specific crystal orientation relationship. The claims of Iwasaki et al '176 do not disclose or suggest the epitaxially grown grains of the upper layer of claim 1.

Iwasaki et al '176 disclose in claim 1 a perpendicular magnetic recording medium having a first perpendicular magnetic layer that has an easy axis of magnetization in its vertical direction

and which contains cobalt, and at column 2, lines 63-66, disclose that the first perpendicular magnetic layer has a segregated structure having magnetic crystal grains and grain boundaries.

However, Iwasaki et al '176 do not clearly disclose a magnetic layer formed of columnar crystal grains. Moreover, Iwasaki et al '176 do not disclose that the first perpendicular magnetic recording layer is formed of plural kinds of substances, namely, Co-containing magnetic crystal grains and an oxide which isolates the grains. Instead, Iwasaki et al '176 disclose at column 5, lines 41-46, that the first perpendicular magnetic recording layer is formed of a single substance, such as CoPt, CoCr, etc.

Thus, Iwasaki et al '176 neither disclose nor suggest a configuration in which the cobalt compound is isolated by an oxide, dispersed in the first perpendicular magnetic recording layer and vertically penetrating the recording layer in columnar forms.

In view of the above, applicants submit that the present claims are not obvious from the claims of the Iwasaki et al '176 patent and, accordingly, request withdrawal of this rejection.

Claims 1, 3-10, 12, 13, 18, 21, 22, 25 and 26 have been rejected under 35 U.S.C. § 102(a), (b) and/or (e) as anticipated by U.S. Patent Application No. 2001/0051287, for reasons of record.

In addition, these claims have been rejected under 35 U.S.C. § 102(e) as anticipated by U.S. Patent 6,830,824 to Kikitsu et al, for reasons of record.

The Examiner continues to maintain that Kikitsu et al disclose all of the recitations of the present claims.

In addition, the above claims have been rejected under 35 U.S.C. § 103(a) as obvious over the Kikitsu et al references.

The Examiner states that while he believes Kikitsu et al provide sufficient disclosure to anticipate the claim limitations, he acknowledges that the combined teachings are found in two Examples and not in one Example.

Applicants note that the U.S. '824 patent is the patent that issued from the published application of U.S. '287. In the following discussion, applicants refer by column and line number to passages from U.S. Patent 6,830,824.

Applicants submit that Kikitsu et al '824 do not disclose or suggest a magnetic recording medium that satisfies the recitations of claims 1 and 18.

Kikitsu et al '824 disclose many different embodiments of a magnetic recording medium. In one embodiment, the magnetic recording medium comprises a substrate, a base layer formed on the substrate and comprising a magnetic material, a switching layer formed on the base layer and comprising a nonmagnetic material and a recording layer formed on the switching layer and having a structure comprising magnetic particles and a nonmagnetic wall buried between the magnetic particles. In various embodiments of Kikitsu et al '824, a functional layer, made of a magnetic material, is provided immediately below and in contact with a recording layer.

The recording layer of Kikitsu et al '824 is a layer that can contain an oxide and can contain columnar, magnetic particles. See Examples 1, 2, 6 and 8 of Kikitsu et al '824. In Kikitsu et al '824, however, the recording layer containing an oxide generally is an upper layer, and generally is present on a lower magnetic layer that contains no oxide. This stacking structure in Kikitsu et al '824 is the opposite of the present invention where the lower layer

contains oxide and columnar grains that vertically isolate the oxide and penetrate the lower layer and the upper layer contains no oxide and grains that are epitaxially grown on the magnetic grains of the lower layer.

Thus, the present invention and Kikitsu et al '824 differ in the stacking order of the magnetic layer containing oxide and the magnetic layer containing no oxide. Further, in Kikitsu et al '824, the magnetic particles of the magnetic layer containing no oxide are not epitaxially grown on the magnetic particles of the magnetic layer containing the oxide.

The Examiner has referred to Examples 13 and 14 of Kikitsu et al '824. These Examples do not suggest the present invention.

Example 13 of Kikitsu et al '824 describes a magnetic recording medium comprised of a glass substrate, a Cr underlayer, a $Co_{77}Cr_{20}Ta_3$ functional layer and a $(Co_{80}Pt_{20})$-(SiO_2) recording layer, stacked in this order. Thus, Kikitsu et al '824 disclose in Example 13 a lower magnetic layer that contains no oxide and an upper layer that contains an oxide. There is no disclosure in Example 13 of Kikitsu et al '824 that the lower layer of Example 13 contains columnar magnetic grains isolated by an oxide and no disclosure that the upper layer contains epitaxially grown magnetic grains.

Example 14 of Kikitsu et al '824 discloses a magnetic recording medium prepared as in Example 11 having a three-layered structure comprising a $Co_{78}Cr_{19}Pt_3$ functional layer, a $(Fe_{55}Pt_{45})Cu_{10}$ recording layer and another $Co_{78}Cr_{19}Pt_3$ functional layer. None of these three layers are layers that contain an oxide, and none of these three layers are layers which are disclosed as containing columnar particles. Further, the recording layer of Example 14 does not contain Co.

Applicants submit that one of ordinary skill in the art would not be led to combining the teachings of Examples 13 and 14 of Kikitsu et al '824 since they relate to different embodiments, and that even if such teachings were combined, they do not teach or suggest that a non-oxide Co-, Cr-containing magnetic layer can or should be formed epitaxially on an oxide-containing Co- and Pt-containing magnetic layer that is comprised of columnar magnetic grains.

At page 5 of the Office Action, the Examiner sets forth a diagram illustrating the two Examples 13 and 14, and states that it would have been obvious to replace the FePtCu crystalline recording layer of Example 14 with the CoPt-oxide recording layer of Example 13. The Examiner argues that the Kikitsu et al specification discloses that, at column 8, line 49 to column 9, line 30, that FePtCu recording layers and CoPt-SiO_2 recording layers are functional equivalents in the field of magnetic recording layers and, therefore, it would have been obvious to substitute one recording layer for a known equivalent recording layer.

The Examiner acknowledges that applicants have argued that Kikitsu et al do not disclose a structure meeting the claimed limitations in a single embodiment. The Examiner states, however, that the test for obviousness is what the combined teachings would have suggested to those of ordinary skill in the art. Thus, applicants understand that the Examiner is arguing that it would have been obvious to replace the FePtCu recording layer of Example 14 with the CoPt-SiO_2 recording layer of Example 13.

In response, applicants again point out that neither Example 13 nor Example 14 of Kikitsu et al disclose that an oxide-containing Co and Pt-containing magnetic layer is comprised of columnar magnetic grains on which there is grown or formed epitaxially a non-oxide CoCr-containing magnetic layer.

Further, applicants submit that it would not have been obvious to one of ordinary skill in the art to replace the FePtCa recording layer of Example 14 with the CoPt-SiO_2 recording layer of Example 13.

Kikitsu et at disclose, in claim 1, a magnetic recording medium comprising a substrate, a base layer formed on the substrate and comprising a magnetic material, a switching layer formed on the base layer and comprising a nonmagnetic material, and a recording layer formed on the switching layer and having a structure comprising magnetic particles and a nonmagnetic wall buried between the magnetic particles.

Kikitsu et al disclose a recording layer having a structure, for example, in which magnetic particles are dispersed in a nonmagnetic material, as disclosed at column 8, lines 49-53. Kikitsu et al describe at column 9, lines 14-20, that the magnetic particles are separated using an oxide, such as SiO_2. Thus, Kikitsu et al intend to apply a granular structure to the recording layer described in Kikitsu et al constituting the magnetic recording medium. See, for example, column 46, lines 54-65, where Kikitsu et al describe the CoPt - SiO_2 recording layer as being a "granular medium."

As mentioned above, magnetic layer having a granular structure was proposed by S. H. Liou et al and, in those days, it was reported, in the attached *Appl. Phys. Lett. 52(6)*:512-514 (February 8, 1988), that the magnetic layer exhibited very suitable characteristics as compared with the conventional various magnetic recording media. In this magnetic layer, since the magnetic crystals are separated by means of the nonmagnetic matrix, the magnetic interaction of the magnetic particles is weak and since the magnetic crystals are small, the magnetic layer having the granular structure has a feature exhibiting an extremely low noise. This feature can

be materialized when the layer having the granular structure in the magnetic layer comprising plural layers is used as the uppermost layer, i.e. the layer closest to the magnetic head.

Also, in the examples of Kikitsu et al, there is no case where a granular structure is given to the lower layer in the magnetic layer comprising plural layers.

That is to say, when such a configuration is applied to the magnetic layer, that is, where a lower magnetic layer has a granular structure, one of ordinary skill in the art would have believed that there is a fair possibility that the characteristic of the lower magnetic layer having the granular structure would be deteriorated by the upper magnetic layer having a non-granular structure. Therefore, applicants submit that the idea of disposing a magnetic layer having a non-granular structure on the recording layer of the magnetic recording medium of Kikitsu et al would not have been obvious to one of ordinary skill in the art.

On the other hand, the magnetic recording medium set forth in amended claim 1 of the present application has a perpendicular magnetic layer comprising a lower layer having Co as a main component and containing Pt and an oxide and an upper layer having Co as a main component and containing Cr and no oxide. In the lower layer, magnetic crystal grains are isolated by the oxide, are dispersed in the lower layer and vertically penetrate the lower layer in columnar forms. In the upper layer, magnetic crystal grains are formed and epitaxially grown on the magnetic crystal grains of the lower layer.

Thus, since the perpendicular magnetic layer constituting the magnetic recording medium set forth in amended claim 1 of the present application has a configuration that is not the configuration in which an upper magnetic layer having a non-granular structure is merely disposed on a lower magnetic layer having a granular structure, applicants submit that the

magnetic recording medium of the present invention is not obvious to those skilled in the art from Kikitsu et al.

In the magnetic recording medium set forth in amended claim 1 of the present application adopting the above configuration, therefore, the magnetic crystal grains of the upper magnetic layer is refined (finely divided), and the crystallinity and orientation thereof are enhanced. See page 17, lines 13-22, of the present specification. As a result, it is made possible to heighten the recording and reproducing characteristic without decreasing the resolution of the reproduced signal. See page 12, lines 17-24, of the present specification.

With the above configuration, as described at page 57, lines 18-22, of the present specification, it is made possible to enhance the signal-to-noise (S/N) ratio to a great extent during the course of reproduction, improve the nucleation field (-Hn) and consequently enhance the property of thermal fluctuation and acquire a medium having a further excellent recording property (OW).

The Examiner acknowledges that applicants have argued that Kikitsu et al fail to disclose epitaxially grown magnetic layers. The Examiner responds by referring to his above argument that the term "epitaxially grown" is interpreted to only mean a crystalline layer. As discussed above in connection with the double patenting rejection, the Examiner's interpretation of the meaning of the term "epitaxially grown" is not correct.

Finally, the Examiner states that applicants have argued that Kikitsu et al fail to disclose a functional layer possessing a columnar structure. The Examiner asserts that this argument is moot, because the claims require that the oxide layer possess columnar crystals which is the

recording layer in Kikitsu et al. The Examiner refers to the diagram that he set forth at page 5 of the Office Action.

However, there is no disclosure in Example 13 of Kikitsu et al that the oxide-containing recording layer contains columnar crystals. Further, Example 14 does not contain any disclosure of columnar grains.

In view of the above, applicants submit that the magnetic recording medium set forth in amended claim 1 of the present application is not disclosed or rendered obvious by Kikitsu et al, and that it follows that claims 3-10 and 12-13 dependent from amended claim 1 are not disclosed or rendered obvious by Kikitsu et al.

In addition, claims 18, 21-22 and 25-26 of the present application are directed to a method for producing the novel magnetic recording medium set forth in amended claim 1. Since the magnetic recording medium produced is novel and unobvious as described above, the method for the production thereof is inevitably novel and unobvious. Therefore, applicants submit that claims 18, 21-22 and 25-26 are patentable over Kikitsu et al.

In view of the above, applicants submit that Kikitsu et al '824 do not disclose or render obvious the subject matter of the present claims and, accordingly, request withdrawal of this rejection.

Claims 5 and 25 have been rejected under 35 U.S.C. § 103(a) as obvious over Kikitsu et al '824 and further in view of U.S. Patent Application No. 2003/0134151 to Usuki et al.

Claims 5 and 25 depend from claims 1 and 18, respectively.

Applicants submit that Usuki et al do not supply the above-noted deficiencies of Kikitsu et al '824 with respect to providing a perpendicular magnetic layer comprised of an oxide-

containing lower layer that contains columnar crystal grains isolated by an oxide and a non-oxide-containing upper layer in which crystal grains are epitaxially grown on the crystal grains of the lower layer.

Usuki et al disclose a magnetic recording medium that contains a primer layer as a lower layer on which an oxide-containing magnetic layer can be formed in a column-like structure. As disclosed in paragraph [0039] of Usuki et al, the magnetic layer comprises a cobalt-containing ferromagnetic metal alloy and a non-magnetic oxide.

The primer layer can be a Cr-containing layer or a ruthenium-containing layer. As disclosed in paragraphs [0114] and [0140] of Usuki et al, the crystal growth of the magnetic layer occurs by reflecting the crystal orientation of the Cr- or Ru-containing primer layer. Thus, Usuki et al do not disclose or suggest an oxide-containing lower layer having a granular structure that contains columnar magnetic crystal grains and a non-oxide containing upper layer in which magnetic crystal grains are epitaxially grown on the magnetic crystal grains of the lower layer.

Usuki et al disclose in paragraph [0108] and in Figs. 3(A) and 4(A), a flexible disc 21 having a magnetic layer 26 formed on each chromium-containing primer layer 25A. The magnetic layer 26 is constituted by a nonmagnetic material 30 and a ferromagnetic alloy 29 that contains at least cobalt, platinum and chromium.

However, Usuki et al neither disclose nor suggest the perpendicular magnetic layer of the present invention comprising a lower magnetic layer having magnetic crystal grains isolated by an oxide, dispersed in the lower layer and penetrating the lower layer in columnar forms and an upper magnetic layer containing no oxide and having magnetic crystal grains epitaxiauy grown on the magnetic crystal grains of the upper magnetic layer.

Neither Kikitsu et at nor Usuki et al disclose a perpendicular magnetic layer constituted a magnetic layer comprising an upper layer of non-granular structure and a lower layer of granular structure.

In view of the above, applicants submit that claims 5 and 25 are patentable over Kikitsu et al and of Usuki et al and, accordingly, request withdrawal of this rejection.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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